A Nationwide Population-Based Study Identifying Health Disparities Between American Indians/Alaska Natives and the General Populations Living in Select Urban Counties

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Objectives. Despite their increasing numbers, little is known about the health of American Indians/Alaska Natives living in urban areas. We examined the health status of American Indian/Alaska Native populations served by 34 federally funded urban Indian health organizations.

Methods. We analyzed US census data and vital statistics data for the period 1990 to 2000.

Results. Disparities were revealed in socioeconomic, maternal and child health, and mortality indicators between American Indians/Alaska Natives and the general populations in urban Indian health organization service areas and nationwide. American Indians/Alaska Natives were approximately twice as likely as these general populations to be poor, to be unemployed, and to not have a college degree. Similar differences were observed in births among mothers who received late or no prenatal care or consumed alcohol and in mortality attributed to sudden infant death syndrome, chronic liver disease, and alcohol consumption.

Conclusions. We found health disparities between American Indians/Alaska Natives and the general populations living in selected urban areas and nationwide. Such disparities can be addressed through improvements in health care access, high-quality data collection, and policy initiatives designed to provide sufficient resources and a more unified vision of the health of urban American Indians/Alaska Natives. (*Am J Public Health.* 2006;96:1478–1484. doi:10.2105/AJPH.2004.053942)

Over the past 3 decades, American Indians and Alaska Natives have increasingly relocated from rural and reservation communities to the urban centers of the United States. Census data show that 61% of American Indians/Alaska Natives resided in these areas in 2000, up from 38% in 1970.[1] Such demographic shifts are related to the federal relocation and termination policies of the 1950s, as well as the educational, employment, and housing opportunities that exist in urban settings.[2]

Although urban living offers more of certain opportunities, the departure of American Indians/Alaska Natives from reservations has typically resulted in a loss of access to health care, historically provided by the Indian Health Service (IHS).[3] To provide health care for the increasingly urban American Indian/Alaska Native (AIAN) population, the IHS awards contracts and grants to 34 nonprofit agencies located in major metropolitan areas across the United States. These agencies, referred to as urban Indian health organizations (UIHOs), exist largely in cities designated in the past as AIAN relocation sites by the federal government.

Despite the increasing numbers of urban American Indians/Alaska Natives, little is known about their health. It is difficult to identify and target this group because of the geographic dispersal and small numbers of urban American Indians/Alaska Natives relative to the general population of the United States. Also, unlike reservation populations, the urban AIAN population comprises multiple tribal groups with diverse ethnic, cultural, and social characteristics. Political diversity exists between tribes that may or may not be recognized by the federal government or state governments. Moreover, degrees of urban acculturation vary, and movement around urban centers may be high as a result of feelings of social and cultural isolation associated with nonreservation living.

Finally, in some regions of the country, American Indians/Alaska Natives are misclassified on vital statistics records.[4,5] Such errors result in consistent underestimation of AIAN rates of infant mortality, injuries, cancer, and overall mortality; some rates are as much as 47% higher after correction for miscoding.[6–9] Studies also indicate a greater likelihood of racial misclassification when American Indians/Alaska Natives die in urban settings.[7,10]

A few studies have addressed the health status of urban American Indians/Alaska Natives but only on a local or regional basis. One population-based investigation compared urban American Indians/Alaska Natives with other urban racial groups residing in a metropolitan area of Washington State. Disparities were found between urban American Indians/Alaska Natives and urban Whites in rates of low birthweight, risk factors for poor birth outcomes, communicable diseases, mortality among nonelderly individuals, injuries, and alcohol-related deaths.[11] The results of other studies have confirmed the disparities found between these 2 urban groups.[12,13]

There is also little information available on the urban AIAN population targeted by the 34 federally funded UIHOs. Such information is necessary for these organizations to allocate their resources effectively, customize health care services, implement program evaluations, and launch policy initiatives. As a group, UIHOs have minimal technological infrastructure with no shared standardized data system that can be used to provide a collective description of their target populations.

Our primary goal was to assess the health status of the urban AIAN population served by UIHOs. As mentioned, this information is critical if these organizations are to demonstrate the effectiveness and impact of their services. Because of the lack of data on the UIHO patient population, data on American Indians/Alaska Natives living in UIHO service areas were used as a proxy for data on American Indians/Alaska Natives served by

TABLE 1—Urban Indian Health Organizations, by Location and Service Area County or Counties

Location	Service Area County or Counties
Albuquerque, NM	Bernalillo
Bakersfield, Calif	Kern
Billings, Mont	Big Horn,[a] Yellowstone[a]
Butte, Mont	Silver Bow[a]
Chicago, Ill	Cook
Dallas, Tex	Collin, Dallas, Denton, Ellis,[a] Hood,[a] Johnson,[a] Kaufman,[a] Parker,[a] Rockwall,[a] Tarrant, Wise[a]
Denver, Colo	Adams, Arapahoe, Boulder,[a] Denver, Douglas,[a] Gilpin,[a] Jefferson
Detroit, Mich	Genesee, Ingham, Kent, Wayne
Flagstaff, Ariz	Coconino[a]
Fresno, Calif	Fresno, Madera,[a] Tulare
Great Falls, Mont	Cascade[a]
Green Bay, Wis	Brown,[a] Door[a]
Helena, Mont	Jefferson,[a] Lewis and Clark[a]
Jamaica Plains, Mass	Suffolk
Lincoln, Neb	Douglas, Lancaster,[a] Sarpy,[a] Washington[a] (Neb); Woodbury[a] (Iowa)
Los Angeles, Calif	Los Angeles
Milwaukee, Wis	Milwaukee, Waukesha
Minneapolis, Minn	Hennepin, Ramsey
Missoula, Mont	Missoula[a]
New York, NY	Bronx, Essex,[a] Kings, Nassau, New York, Queens, Richmond, Westchester
Oakland, Calif	Alameda, Contra Costa, Marin,[a] San Francisco, San Mateo
Phoenix, Ariz	Maricopa
Pierre, SD	Brown,[a] Hughes,[a] Minnehaha,[a] Stanley[a]
Portland, Ore	Clackamas, Multnomah, Washington (Ore); Clark[a] (Wash)
Reno, NV	Carson City,[a] Churchill,[a] Douglas,[a] Storey,[a] Washoe
Sacramento, Calif	Sacramento
Salt Lake City, Utah	Davis,[a] Salt Lake, Tooele,[a] Utah, Weber[a]
San Diego, Calif	San Diego
San Jose, Calif	Santa Clara
Santa Barbara, Calif	San Luis Obispo,[a] Santa Barbara, Ventura
Seattle, Wash	King
Spokane, Wash	Spokane
Tucson, Ariz	Pima
Wichita, Kan	Butler,[a] Reno,[a] Sedgwick, Sumner[a]

[a]Population less than 250 000.

the UIHOs. In addition, their health status was used to approximate that of the larger urban AIAN population. By assessing standard socioeconomic, maternal and child health, and mortality indicators, our study also addressed the *Healthy People 2010* initiative to eliminate racial health disparities.[14]

Specifically addressing the health of the urban AIAN population is an important step in including this group in efforts to improve the health status of the entire AIAN population; however, this inclusion of urban American Indians/Alaska Natives in such efforts should not minimize the importance of nonurban AIAN populations facing similar health disparities. To our knowledge, this is the first nationwide population-based study examining the health status of urban American Indians/Alaska Natives.

METHODS

In our analyses, we used national data from the 2000 US census as well as death certificate (1990–1999), birth certificate (1991–2000), and linked infant death/natality (1995–2000) data from the National Center for Health Statistics (NCHS). For confidentiality reasons, identifying information was omitted from all of the vital record data we obtained, and linked infant death/natality data were restricted to counties with populations greater than 250 000 according to 1990 US census counts.

We included all of the 34 UIHOs, which are located in 19 states (Table 1). The overall UIHO service area comprises 94 counties, with the number of counties per individual service area ranging from 1 to 11. As a result of the exclusion of 43 counties with populations less than 250 000, we conducted linked infant death/natality analyses on 51 (53%) of the 94 UIHO service area counties. Approximately 78% of all AIAN births and 95% of overall births in UIHO service area counties occurred in this combined 51-county area.

Here the term "American Indians/Alaska Natives," which can refer to either mixed-race or single-race groups, is used to indicate the single-race category unless otherwise indicated. The term "general population" refers to the overall population of the United States, including all racial/ethnic groups. In addition, "American Indians/Alaska Natives" and "general population" are used to identify residents of UIHO service areas or the respective nationwide populations. The nationwide general population includes the AIAN populations living in UIHO service areas.

The data sources examined varied in terms of the racial categories used. In the 1990 census and the mortality, natality, and linked infant death/natality data, 5 categories were used: White, Black, American Indian/Alaska Native, Asian/Pacific Islander, and other. In the 2000 census, 6 categories were used: White, Black, American Indian/Alaska Native, Asian, Hawaiian or other Pacific Islander, and other; respondents could also indicate mixed racial heritage.

Causes of death were classified according to the *International Classification of Diseases, 10th Revision* (*ICD-10*).[15] We converted data collected before 1999 to *ICD-10*–based causes using *ICD-9* equivalents, adjusting discrepancies through the use of NCHS comparability ratios.[16]

VistaPHw software (Public Health, Seattle, Washington) was used in conducting the analyses.[17] Mortality rate calculations were based on NCHS census and intercensal population estimates (i.e., "bridged" population estimates based on the 2000 census, adjusted to reflect 1990 census racial group estimates).[18,19] Total population mortality rates were adjusted to a standardized year 2000 age distribution.[20] Otherwise, standard methods were used in calculating rate estimates.[16,17,20–23]

Statistical significance was defined as lack of overlap in the 95% confidence intervals between different rates. An extension of the Mantel–Haenszel χ^2 trend test was used to measure the significance ($P<.05$) of trends observed.[24]

We performed data averaging to minimize data variability and improve the stability of our estimates. In addition, data averaging promoted confidentiality by preventing identification of years of occurrence in instances in which there were small numbers of measured events. We calculated 10-year averages for mortality (1990–1999) and natality (1991–2000) data and 6-year averages for infant mortality data (1995–2000). We did not perform data averaging for census data. Mortality and natality data from UIHO service areas with fewer than 10 relevant events were excluded from UIHO-specific analyses but were included in analyses of the overall UIHO service area.

RESULTS

In the 2000 census, of approximately 4.1 million Americans who reported AIAN heritage (alone or mixed race), 60% (2.5 million) reported AIAN heritage alone. Sixty-one percent (1.5 million) of the AIAN-alone group lived in urban areas, and 34% (500 000) of these urban residents lived in counties served by UIHOs. The number of American Indians/Alaska Natives living in different UIHO service areas ranged from 700 to 77 000.

Socioeconomic Characteristics

Table 2 lists the socioeconomic characteristics of American Indians/Alaska Natives and the general populations living in UIHO service areas and nationwide in 2000. According to 1999 figures, approximately 25% of American Indians/Alaska Natives living in UIHO service areas and nationwide were members of households with incomes below the poverty level, a percentage roughly twice that of the corresponding general populations. Analyses conducted by age group showed that the highest poverty rates were those among AIAN children (30%–32%).

The percentages of American Indians/Alaska Natives with a 4-year college degree, both in UIHO service areas and nationwide, were less than half the percentages found for the corresponding general populations; similar disparities were observed in unemployment rates. In addition, the percentages of AIAN children living in UIHO service areas and nationwide who were members of single-parent families were substantially higher than those of the corresponding general populations. In all UIHO service areas, AIAN rates of poverty, unemployment, and children living in single-parent families exceeded those of the general population.

Nearly 1 in 4 American Indians/Alaska Natives living in UIHO service areas and nationwide had a disability (defined in this study as a long-lasting physical, mental, or emotional condition making it difficult for one to engage in activities such as walking, climbing stairs, dressing, bathing, learning, and remembering), compared with 1 in 5 members of the corresponding general populations. In all but 1 UIHO service area, the percentage of American Indians/Alaska Natives who were disabled exceeded the percentage observed in the general population.

Maternal and Child Health

Between 1991 and 2000, of approximately 400 000 AIAN infants born nationwide, roughly 20% were born in UIHO service areas. Whereas the nationwide AIAN birth rate during this period was similar to the general population rate (15.5 and 14.8 per 1000, respectively), the birth rate among American Indians/Alaska Natives living in UIHO service areas was approximately one quarter lower than that in the general population (12.8 and 16.5 per 1000, respectively).

Table 3 lists prevalences of poor birth outcomes and risk factors as well as factors associated with infant deaths. The percentages of AIAN infants with low birthweights born to mothers living in UIHO service areas and nationwide were significantly lower than the percentages for all mothers combined (i.e., the general populations) in these areas. Patterns of disparities varied between UIHO service areas. Over time, from 1991 to 2000, low-birthweight rates significantly increased in all populations with the exception of American Indians/Alaska Natives living in UIHO service areas. Rates of premature births among AIAN mothers living in UIHO service areas and nationwide were higher than rates among all mothers combined in these areas. From 1991 to 2000, prematurity rates increased significantly in all populations.

Analyses of risk factors for poor birth outcomes revealed significant disparities between American Indians/Alaska Natives and the general population in birth rates among mothers who were teenagers, who were unmarried, who received late or no prenatal care, and who smoked or consumed alcohol during their pregnancy. Birth rates among teenage AIAN mothers living in UIHO service areas and nationwide were 80% higher than rates among all teenage mothers combined. Over time, birth rates among teenage mothers significantly decreased in all populations with the exception of the UIHO AIAN population.

Both in UIHO service areas and nationwide, AIAN mothers received late or no

TABLE 2—Socioeconomic Characteristics Among Urban American Indians/Alaska Natives, 2000

	UIHO Service Area Populations, % (95% CI)		Nationwide Populations, % (95% CI)	
	AIAN	General	AIAN	General
Income below 100% of federal poverty level	24.1 (23.5, 24.6)	13.5 (13.5, 13.6)	25.7 (25.5, 25.9)	12.4 (12.4, 12.4)
Income below 200% of federal poverty level	48.2 (47.6, 48.9)	30.4 (30.4, 30.5)	51.4 (51.2, 51.6)	29.6 (29.6, 29.7)
Adult (≥18 y) income below 100% of federal poverty level	21.2 (20.6, 21.9)	11.8 (11.8, 11.9)	22.7 (22.5, 23.0)	10.9 (10.9, 10.9)
Child (<18 y) in family with income below 100% of federal poverty level	30.1 (29.1, 31.1)	18.4 (18.3, 18.5)	31.6 (31.2, 32.0)	16.6 (16.5, 16.6)
Education level (≥25 y)				
High school	70.4 (69.6, 71.2)	79.6 (79.6, 79.7)	70.9 (70.6, 71.2)	80.4 (80.4, 80.4)
College	13.0 (12.4, 13.6)	28.9 (28.9, 29.0)	11.5 (11.3, 11.7)	24.4 (24.4, 24.4)
Unemployed (≥16 y)	11.5 (10.9, 12.1)	6.3 (6.3, 6.4)	12.3 (12.0, 12.5)	5.7 (5.7, 5.7)
Single-parent family with related children	46.1 (44.5, 47.7)	31.0 (30.8, 31.1)	43.5 (42.9, 44.2)	29.2 (29.2, 29.3)
Disability (≥5 y)	23.9 (23.3, 24.4)	19.1 (19.1, 19.2)	24.3 (24.1, 24.5)	19.3 (19.3, 19.4)

Note. UIHO = urban Indian health organization; CI = confidence interval; AIAN = American Indian/Alaska Native. All AIAN results differed significantly from those of the corresponding general population. Data were derived from the US Census Bureau.

TABLE 3—Poor Birth Outcomes, Risk Factors for Poor Birth Outcomes, and Factors Associated With Infant Deaths Among American Indians/Alaska Natives: Selected Time Periods

	UIHO Service Area Populations				Nationwide Populations			
	AIAN		General		AIAN		General	
	% (95% CI)	Direction of Trend (*P*)	% (95% CI)	Direction of Trend (*P*)	% (95% CI)	Direction of Trend (*P*)	% (95% CI)	Direction of Trend (*P*)
Risk factors for poor birth outcomes (1991–2000)[a]								
Low birthweight (< 2500 g)	6.8 (6.6, 7.0)	NS	7.3 (7.2, 7.3)	Upward (.000)	6.6 (6.5, 6.7)	Upward (.000)	7.4 (7.4, 7.4)	Upward (.000)
Premature birth	12.3[b] (12.1, 12.5)	Upward (.028)	10.9 (10.9, 11.0)	Upward (.000)	12.2[b] (12.1, 12.3)	Upward (.000)	11.2 (11.2, 11.2)	Upward (.000)
Mother's age < 18 y	8.2[b] (8.0, 8.4)	NS	4.6 (4.5, 4.6)	Downward (.000)	8.2[b] (8.2, 8.3)	Downward (.008)	4.8 (4.8, 4.9)	Downward (.000)
Mother unmarried	60.3[b] (59.8, 60.8)	Upward (.000)	34.8 (34.7, 34.8)	Downward (.000)	57.4[b] (57.2, 57.7)	Upward (.000)	31.9 (31.9, 31.9)	Upward (.000)
Mother received late or no prenatal care	9.8[b] (9.6, 10.0)	Downward (.000)	5.0 (5.0, 5.0)	Downward (.000)	9.5[b] (9.4, 9.6)	Downward (.000)	4.4 (4.4, 4.4)	Downward (.000)
Mother smoked during pregnancy	17.2[b] (16.9, 17.5)	Downward (.000)	10.7 (10.7, 10.7)	Downward (.000)	21.1[b] (21.0, 21.3)	Downward (.000)	14.3 (14.3, 14.3)	Downward (.000)
Mother used alcohol during pregnancy	5.2[b] (5.0, 5.3)	Downward (.000)	1.5 (1.5, 1.5)	Downward (.000)	4.6[b] (4.6, 4.7)	Downward (.000)	1.6 (1.6, 1.6)	Downward (.000)
Factors associated with infant deaths (1995–2000)[c]								
Mother unmarried	69.8[b] (61.3, 79.2)	NS	49.4 (48.7, 50.1)	NS	65.4[b] (62.1, 68.9)	NS	47.1 (46.8, 47.5)	Upward (.006)
Very low birthweight (< 1500 g)	38.9 (32.6, 46.1)	Upward (.005)	51.4 (50.6, 52.1)	Upward (.000)	35.1 (32.7, 37.8)	Upward (.004)	51.0 (50.6, 51.3)	Upward (.000)
Low birthweight (< 2500 g)	54.4 (46.9, 62.8)	NS	65.7 (64.9, 66.5)	Upward (.000)	49.8 (46.8, 52.9)	Upward (.017)	65.3 (64.9, 65.7)	Upward (.000)
Premature birth	53.6 (46.0, 62.1)	NS	64.1 (63.3, 64.9)	Upward (.000)	50.1 (47.1, 53.3)	Upward (.033)	64.3 (63.9, 64.6)	Upward (.000)
Mother smoked during pregnancy	25.1[b] (19.3, 32.0)	NS	15.5 (15.0, 16.0)	Downward (.000)	29.6[b] (27.1, 32.3)	NS	19.5 (19.3, 19.7)	Downward (.000)
Mother's age < 18 y	11.1[b] (7.9, 15.2)	NS	7.0 (6.8, 7.3)	Downward (.000)	10.1[b] (8.8, 11.6)	NS	7.6 (7.4, 7.7)	Downward (.000)
Mother used alcohol during pregnancy	9.1[b] (5.7, 13.7)	NS	2.2 (2.0, 2.4)	Downward (.000)	7.4[b] (6.2, 8.8)	NS	2.3 (2.2, 2.4)	Downward (.000)
Mother received late or no prenatal care	16.6[b] (12.4, 21.6)	NS	9.0 (8.7, 9.3)	Downward (.000)	13.9[b] (12.3, 15.7)	NS	8.8 (8.6, 8.9)	Downward (.000)

Note. UIHO = urban Indian health organization; AIAN = American Indian/Alaska Native; CI = confidence interval; NS = no statistically significant trend over the time period; Upward = significant increasing trend over the time period; Downward = significant decreasing trend over the time period.
[a]Data derived from National Center for Health Statistics natality files.
[b]Significantly higher for American Indians/Alaska Natives than for the general population.
[c]Data derived from National Center for Health Statistics linked birth/infant death files.

prenatal care at approximately twice the frequency of all mothers combined. Also, rates of maternal smoking were substantially higher among American Indians/Alaska Natives living in UIHO service areas and nationwide than among all mothers combined. Alcohol consumption rates among AIAN mothers living in UIHO service areas were significantly higher than rates among AIAN mothers nationwide; both rates were approximately 3 times higher than rates among all mothers combined in these areas.

Mortality Statistics

Table 3 presents data on several factors associated with AIAN infant deaths between 1995 and 2000. Unmarried status was associated with 70% of the AIAN infant deaths in UIHO service areas and 65% nationwide. Other associated factors included maternal smoking, teenage motherhood, late or no prenatal care, and maternal alcohol consumption, the last of which was 3 to 4 times more common among AIAN mothers living in UIHO service areas and nationwide than among all mothers combined in these areas.

Table 4 lists overall and cause-specific mortality rates for infants and for individuals of all ages. From 1995 to 2000, AIAN infant mortality rates in UIHO service areas and nationwide were higher than rates for the corresponding general populations. Over time, infant mortality rates significantly decreased in the general populations living in UIHO service areas and nationwide; however, no such trends were observed in the AIAN population.

From 1995 to 2000, sudden infant death syndrome (SIDS) was the leading cause of AIAN infant mortality in UIHO service areas. The SIDS rates among American Indians/Alaska Natives in UIHO service areas and nationwide were at least twice the rates observed in the corresponding general populations. Over time, SIDS rates significantly decreased in all populations with the exception of American Indians/Alaska Natives living in UIHO service areas.

Of approximately 100 000 AIAN deaths reported nationwide from 1990 to 1999, roughly 20% occurred among American Indians/Alaska Natives living in UIHO service areas. The mortality rate in the UIHO AIAN population was substantially lower than that in the nationwide AIAN population (574 and 769 per 100 000, respectively). Also, the UIHO AIAN mortality rate was lower than the rates observed in the general population living in the UIHO service areas (884 per 100 000) and the overall US general population (902 per 100 000). From 1990 to 1999, mortality decreased significantly in all of the populations examined with the exception of the nationwide AIAN population, in which there was a significant increase. UIHO AIAN mortality rates ranged from 120 to 1388 per 100 000.

Heart disease was the leading cause of death in the AIAN and general populations. As was the case with overall mortality, heart disease mortality rates were substantially lower among American Indians/Alaska Natives living in UIHO service areas than in the nationwide AIAN population and the corresponding general populations. From 1990 to 1999, heart disease mortality rates decreased significantly in all populations. UIHO AIAN rates ranged from 46 to 385 per 100 000.

Cancer was the second leading cause of death among American Indians/Alaska Natives living in UIHO service areas and nationwide. As with overall mortality, cancer mortality rates were substantially lower among American Indians/Alaska Natives living in UIHO service areas than in the nationwide AIAN and corresponding general populations. From 1990 to 1999, cancer mortality rates decreased significantly in the general population, whereas AIAN rates either remained steady or increased. UIHO AIAN cancer mortality rates ranged from 20 to 517 per 100 000.

Rates of mortality attributable to unintentional injuries, chronic liver disease/cirrhosis, diabetes, and alcohol use among American Indians/Alaska Natives, both in UIHO service areas and nationwide, surpassed those of the corresponding general populations. From 1990 to 1999, unintentional injury mortality

TABLE 4—Overall and Cause-Specific Mortality Rates Among American Indians and Alaska Natives: Selected Time Periods

	UIHO Service Area Populations				Nationwide Populations			
	AIAN		General		AIAN		General	
	Rate per 100 000 (95% CI)	Direction of Trend (*P*)	Rate per 100 000 (95% CI)	Direction of Trend (*P*)	Rate per 100 000 (95% CI)	Direction of Trend (*P*)	Rate per 100 000 (95% CI)	Direction of Trend (*P*)
Infant mortality (1995–2000)[a]	9.0[b,c] (8.1, 10.0)	NS	6.8[b] (6.7, 6.8)	Downward (.000)	9.1[c] (8.7, 9.5)	NS	7.2 (7.2, 7.2)	Downward (.000)
Sudden infant death syndrome	1.8[b,c] (1.4, 2.3)	NS	0.7[b] (0.7, 0.7)	Downward (.000)	1.7[c] (1.5, 1.8)	Downward (.000)	0.8 (0.8, 0.8)	Downward (.000)
All-age/all-cause mortality (1990–1999)[d]	573.9 (564.3, 583.7)	Downward (.000)	883.5 (882.7, 884.3)	Downward (.000)	769.0 (763.7, 774.4)	Upward (.001)	902.2 (901.8, 902.6)	Downward (.000)
Heart disease	145.0 (139.8, 150.3)	Downward (.002)	290.0 (289.6, 290.5)	Downward (.000)	206.0 (203.0, 208.9)	Downward (.000)	289.0 (288.8, 289.2)	Downward (.000)
Cancer	98.0 (94.0, 102.2)	NS	201.9 (201.5, 202.2)	Downward (.000)	137.3 (135.0, 139.6)	NS	210.1 (209.9, 210.2)	Downward (.000)
Unintentional injuries	42.7[c] (40.7, 44.9)	NS	31.0 (30.8, 31.1)	Downward (.000)	60.4[c] (59.2, 61.6)	Downward (.000)	35.5 (35.5, 35.6)	Downward (.000)
Chronic liver disease/ cirrhosis	27.5[c] (25.9, 29.3)	NS	12.2 (12.1, 12.3)	Downward (.000)	25.5[c] (24.7, 26.3)	NS	10.4 (10.3, 10.4)	Downward (.000)
Diabetes	32.0[c] (29.7, 34.4)	Upward (.025)	20.8 (20.7, 20.9)	Upward (.000)	44.7[c] (43.4, 46.0)	Upward (.000)	22.9 (22.8, 22.9)	Upward (.000)
Cerebrovascular diseases	34.5 (32.0, 37.2)	NS	61.2 (61.0, 61.5)	Downward (.000)	48.8 (47.4, 50.3)	NS	65.4 (65.3, 65.5)	Downward (.000)
Assault (homicide)	9.0 (8.3, 9.9)	Downward (.001)	11.5 (11.4, 11.6)	Downward (.000)	9.5[c] (9.1, 9.9)	Downward (.000)	8.2 (8.2, 8.2)	Downward (.000)
Suicide	8.1 (7.3, 8.9)	NS	11.2 (11.1, 11.3)	Downward (.000)	10.9 (10.5, 11.4)	NS	11.6 (11.6, 11.7)	Downward (.000)
Chronic lower respiratory diseases	21.8 (19.9, 24.0)	NS	39.8 (39.7, 40.0)	Upward (.000)	30.0 (28.9, 31.1)	Upward (.000)	42.1 (42.0, 42.2)	Upward (.000)
Influenza and pneumonia	20.6 (18.6, 22.8)	NS	26.5 (26.3, 26.6)	Downward (.000)	25.1[c] (24.0, 26.2)	NS	23.8 (23.7, 23.8)	Downward (.000)
Alcohol related	28.1[c] (26.5, 29.9)	Downward (.001)	10.1 (10.0, 10.2)	Downward (.000)	26.6[c] (25.8, 27.4)	Downward (.000)	7.3 (7.3, 7.4)	Downward (.000)
Drug related	9.0 (8.2, 9.9)	Upward (.004)	9.4 (9.4, 9.5)	Upward (.000)	6.0 (5.7, 6.3)	Upward (.000)	6.2 (6.2, 6.2)	Upward (.000)
Firearm related	8.0 (7.2, 8.8)	Downward (.017)	14.1 (14.0, 14.1)	Downward (.000)	10.5 (10.1, 10.9)	Downward (.000)	13.0 (12.9, 13.0)	Downward (.000)

Note. UIHO = urban Indian health organization; AIAN = American Indian/Alaska Native; CI = confidence interval; NS = no statistically significant trend over the time period; Downward = significant decreasing trend over the time period; Upward = significant increasing trend over the time period. Cause-specific mortality rates for all ages are listed in rank order on the basis of total numbers of deaths.
[a]Data derived from National Center for Health Statistics linked birth/infant death files.
[b]Rate calculated only for counties with populations above 250 000 according to 1990 census.
[c]Significantly higher for American Indians/Alaska Natives than for the general population.
[d]Data derived from National Center for Health Statistics multiple cause of death files.

rates decreased significantly in all of the populations assessed with the exception of American Indians/Alaska Natives living in UIHO services areas; UIHO AIAN rates ranged from 6 to 140 per 100 000. From 1990 to 1999, chronic liver disease mortality rates decreased significantly in the general population; however, no such trends were observed among American Indians/Alaska Natives. UIHO AIAN rates ranged from 3 to 82 per 100 000. From 1990 to 1999, diabetes mortality increased significantly in all populations; UIHO AIAN rates ranged from 4 to 105 per 100 000. Finally, from 1990 to 1999, mortality rates related to alcohol consumption decreased significantly in all populations; UIHO AIAN rates ranged from 3 to 71 per 100 000.

DISCUSSION

Health Disparities

The present findings reveal striking health disparities between the AIAN and general populations both in UIHO service areas and nationwide; it is likely that disparities in socioeconomic status contribute to many of the other disparities identified. American Indians/Alaska Natives were approximately twice as likely as the general populations of these areas to be poor, to be unemployed, and to not have a college degree. Similar differences were observed in births among mothers who received late or no prenatal care or consumed alcohol and in mortality attributed to SIDS, chronic liver disease, and alcohol consumption. Most striking was the alcohol consumption rate among AIAN mothers, which was as much as 3 to 4 times that of all mothers combined. The disparities observed in maternal and child health were consistent with the results of previous studies.[12,13]

The percentages of AIAN infants born in UIHO service areas proportionally mirrored the percentages of American Indians/Alaska Natives living in these areas. It is not clear why UIHO AIAN birth rates were lower than those observed in the general populations assessed. This result contrasted with UIHO AIAN infant mortality rates, which exceeded those of the general populations. A possible reason for the lower UIHO AIAN birth rates is increased mobility among the maternal UIHO AIAN population that results in deliveries taking place outside of UIHO service areas. Further clarification is needed on this issue.

Whereas percentages of AIAN infants with low birthweights varied between individual UIHO service areas, the overall UIHO service area, and nationwide, the AIAN percentages were lower than those of the corresponding general populations. A previous study showed that AIAN mothers who deliver in IHS facilities were more likely to be diabetic than their counterparts in the general population.[25] It is unclear whether maternal diabetes, which typically results in deliveries of larger newborns, was the reason for the decreased percentage of low-birthweight infants observed here in the UIHO AIAN population; further research is needed.

The percentages of American Indians/Alaska Natives who died in UIHO service areas proportionally mirrored the percentages of American Indians/Alaska Natives living in these areas. It is unclear why the UIHO AIAN mortality rates observed were so much lower than nationwide AIAN and general population rates. The same patterns were seen with mortality attributable to heart disease, cancer, cerebrovascular diseases, and several other causes.

Although the findings just described may suggest improved health among American Indians/Alaska Natives living in UIHO service areas, the differences seen between urban and nationwide AIAN rates were not mirrored by the differences seen between urban and nationwide general population rates. An explanation for the lower UIHO AIAN mortality rates is movement among American Indians/Alaska Natives to locations outside of UIHO service areas. The extreme variability in rates between UIHO service areas, however, suggests racial misclassification errors; such errors occur more frequently in urban settings and on death certificates. Racial misclassification errors have been shown to result in disproportionately flawed cardiovascular mortality rates for the AIAN population.[26] Future efforts need to focus on instituting changes that prevent such errors from occurring.

In general, the indicator rates and degrees of disparity observed between American Indians/Alaska Natives and the general populations living in UIHO service areas largely mirrored those observed between American Indians/Alaska Natives and the general population nationwide. Exceptions included maternal consumption of alcohol, for which the degree of disparity was higher in UIHO service areas, and mortality rates associated with certain causes such as unintentional injuries and alcohol use, for which the degree of disparity was higher nationwide.

Limitations

As mentioned, our goal was to provide an understanding of the health status of the urban AIAN population residing in UIHO service areas. However, 66% of urban American Indians/Alaska Natives do not live in these areas. Although exclusion of this group may affect the generalizability of our findings, there are several points to consider. For example, the indicator rates and degrees of disparity observed among American Indians/Alaska Natives residing in UIHO service areas largely mirrored those in the nationwide AIAN population, suggesting that the former was a reasonable proxy for the urban population not included in our analyses. Also, given that our results indicate the presence of significant disparities between American Indians/Alaska Natives and the general populations living in UIHO service areas, UIHOs can use our data to better serve these urban populations.

Although we used county-aggregated data, 43 counties with populations less than 250 000 (46% of the overall UIHO service area) did not have data available for analysis. However, data on 78% of births and 85% of the total UIHO AIAN population were still available, and this exclusion of smaller counties was unlikely to have resulted in significant differences in our results.

Despite the likelihood of racial misclassification errors, we undertook no corrective measures given that the racial misclassification adjustment factors developed by the IHS are useful only at the regional and state levels. Because previous studies have shown that misclassification of AIAN populations leads to consistent underestimates, we assume that any correction of our estimates would result in larger disparities.

Addressing Health Disparities

The present findings highlight major health disparities between the AIAN population and

general populations living in select urban settings. Any presumptions that American Indians/Alaska Natives are thriving in cities should be reconsidered. Clearly, this population faces many of the same challenges as nonurban AIAN populations. Efforts to address health disparities between American Indians/Alaska Natives and general populations in urban settings must also address disparities in access to care. A recent study showed that, in comparison with Whites, AIAN populations less frequently have insurance coverage or access to health care and that they use health care services less often.[27] In addition, although UIHOs are the primary health care venue for urban American Indians/Alaska Natives, who represent more than 60% of the nationwide AIAN population, IHS allocations for these organizations represent 1% of the total IHS budget.[3]

Effective efforts to address the health disparities found between the AIAN population and general populations living in urban areas require ongoing collection of comprehensive and accurate data. Racial misclassification errors can be reduced or eliminated only through the creation of standard definitions and collection mechanisms that are consistently used by local, state, and federal public health agencies. At present, no formal mechanism exists for documenting or tracking the health status of the urban AIAN population. The gap in surveillance data for this population raises questions on how to best meet *Healthy People 2010* goals to reduce and eliminate health disparities in the United States.[28] Public health institutions should consider initiating surveillance systems and incorporating and implementing standardized racial classification schemes.[6]

Policy initiatives are needed that would provide additional funding for health-related services and research activities related to urban AIAN health. In addition, further research is needed to assess the extent to which the UIHO AIAN population is representative of the overall AIAN population, the percentages of urban American Indians/Alaska Natives served by UIHOs, the scope of UIHO health-related services, and the health care services and providers used by urban American Indians/Alaska Natives not residing in UIHO service areas. Because the current urban AIAN health system is fragmented and decentralized, there is an urgent need for leadership to refocus and unify the system into a more cohesive and coherent national health care initiative.

Our findings show that urban American Indians/Alaska Natives are faced with an ongoing health crisis. We found significant health disparities between the AIAN population and the general population both in urban areas and nationwide. Partnerships between tribal, federal, state, and local public health institutions should be pursued to successfully assess, address, and eliminate these disparities. ■

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Human Participant Protection

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References

1. *2000 Census of the Population: General Population Characteristics—United States.* Washington, DC: US Bureau of the Census; 2000.

2. Burhansstipanov L. Urban Native American health issues. Paper presented at: National Action Plan on Breast Cancer Workshop, March 1999, Washington, DC.

3. Forquera R. *Urban Indian Health.* Washington, DC: Kaiser Family Foundation; 2001.

4. Rosenberg HM, Maurer JD, Sorlie PD, et al. Quality of death rates by race and Hispanic origin: a summary of current research, 1999. *Vital Health Stat 2.* 1999;No. 128.

5. *Adjusting for Miscoding of Indian Race on State Death Certificates.* Washington, DC: Indian Health Service; 1996.

6. Hahn RA, Mulinare J, Teutsch S. Inconsistencies in coding of race and ethnicity between birth and death in US infants. *JAMA.* 1992;267:259–263.

7. Stehr-Green P, Bettles J, Robertson LD. Effect of racial/ethnic misclassification of American Indians and Alaskan Natives on Washington State death certificates, 1989–1997. *Am J Public Health.* 2002;92:443–444.

8. Sugarman JR, Brenneman G, LaRoque W, et al. The urban American Indian oversample in the 1998 national maternal and infant health survey. *Public Health Rep.* 1994;109:243–250.

9. Frost F, Taylor V, Fries E. Racial misclassification of Native Americans in a surveillance, epidemiology, and end results cancer registry. *J Natl Cancer Inst.* 1992;84:957–962.

10. Epstein M, Moreno R, Bacchetti P. The underreporting of deaths of American Indian children in California, 1979 through 1993. *Am J Public Health.* 1997; 87:1363–1366.

11. Grossman DC, Krieger JW, Sugarman JR, et al. Health status of urban American Indians and Alaska Natives: A population-based study. *JAMA.* 1994;271: 845–850.

12. Grossman DC, Baldwin L, Casey S, et al. Disparities in infant health among American Indians and Alaska Natives in US metropolitan areas. *Pediatrics.* 2002;109:627–633.

13. Baldwin L, Grossman DC, Casey S, et al. Perinatal and infant health among rural and urban American Indians/Alaska Natives. *Am J Public Health.* 2002;92: 1491–1497.

14. Health People 2010: Understanding and Improving Health. Washington, DC: US Dept of Health and Human Services; 2001.

15. *International Classification of Diseases, 10th Revision.* Geneva, Switzerland: World Health Organization; 1994.

16. National Center for Health Statistics. Comparability of cause of death between ICD-9 and ICD-10: preliminary estimates. *Natl Vital Stat Rep.* May 18, 2001;49(2).

17. Solet D, Glusker A, Laurent A, Yu T. Innovations in User-defined Analysis: Dynamic Grouping and Customized User Datasets in VistaPHw. *J Public Health Manag Pract.* 2006 March/April;12(2):130-138.

18. Ingram DD, Parker JD, Schenker N, et al. United States census 2000 population with bridged race categories. *Vital Health Stat 2.* 2003;No. 135.

19. Bridged-race intercensal population estimates for July 1, 1990–July 1, 1999, by year, county, 5-year age groups, bridged-race, Hispanic origin, and sex. Available at: http://www.cdc.gov/nchs/about/major/dvs/popbridge/datadoc.htm#inter5. Accessed February 6, 2006.

20. Klein RJ, Schoenborn CA *Age Adjustment Using the 2000 Projected US Population.* Hyattsville, Md: National Center for Health Statistics; 2001.

21. Martin JA, Hamilton BE, Ventura SJ, Menacker F, Park MM. Births: final data for 2000. *Natl Vital Stat Rep.* February 12, 2002;50(5).

22. Mathews TJ, Menacker F, MacDorman MF. Infant mortality statistics from the 2000 period linked birth/infant death data set. *Natl Vital Stat Rep.* August 28, 2002;50(12).

23. Hoyert DL, Arias E, Smith BL, Murphy SL, Kochanek KD. Deaths: final data for 1999. *Natl Vital Stat Rep.* September 21, 2001;49(8).

24. Mantel N. Chi-square tests with 1 degree of freedom: extensions of the Mantel-Haenszel procedure. *J Am Stat Assoc.* 1963;58:690–700.

25. Indian Health Service. *Trends in Indian Health.* Rockville, Md: US Dept of Health and Human Services; 2001.

26. Rhoades D. Racial misclassification and disparities in cardiovascular disease among American Indians and Alaska Natives. *Circulation.* 2005;111:1250–1256.

27. Zuckerman S, Haley J, Roubideaux Y, et al. Health service access, use, and insurance coverage among American Indians/Alaska Natives and whites: what role does the Indian Health Service play? *Am J Public Health.* 2004;94:53–59.

28. *Tracking Healthy People 2010.* Washington, DC: US Dept of Health and Human Services; 2000.